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Original Article

Prevalence of refractive error in school children of Karachi

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Abstract

Objective: To find out the prevalence of refractive error and the eye morbidity in the school children and the associated factors.

Methods: One thousand students were selected from different schools of Karachi adopting two stage sampling technique. List of schools was obtained from Board of Secondary Education and 20 schools were randomly selected from the list in the five districts of Karachi during that period. Fifty students from each school were then selected adopting simple random technique.

Result: A total of 1000 children from 20 schools were selected. However 940 were examined. The prevalence of refractive error was 8.9%. Mean age of the students was 9.49±2.5. Dominant ethnic group was Urdu speaking. Only 10.9% children were ever checked for their ophthalmic examination. Refractive error was associated with female sex but no association was found with class, age, ethnicity, parental education and other risk factors. About 1% students were color blind. Lack of association with increasing class may be due to poor educational training at Public sector schools.

Conclusion: An increased prevalence of refractive error was found in this study. There is a need of periodical eye examination, preferably while entering and leaving the school (JPMA 58:322;2008).

Introduction

The global initiative for the Elimination of Avoidable Blindness sets a major challenge to work relentlessly to avoid the preventable blindness. This initiative will also require both government and private sector's commitment to allocate more budgets to increase significantly the provision and uptake of eye care services. Refractive errors have been listed, along with cataract, trachoma, onchocerciasis and childhood blindness, among eye problems whose prevention and cure should provide enormous savings and facilitate societal developments.[1] The number of visually impaired persons in the world is about 259 millions. This estimate includes 98 millions persons with visual impairment due to uncorrected refractive error.[2]

Many studies have been conducted to determine the prevalence of refractive errors through out the world.[3,4] Though some of the studies have been conducted in Pakistan, but except a few, many of them were either focused on adults or Afghani and Bangladeshi children.[5-8] These studies revealed that the prevalence of refractive error varies from 1% to 8%.

Uncorrected refractive errors are an important cause of visual impairment in many countries. In a study conducted at New Delhi, refractive error was the cause in 81.7% of eyes with vision impairment.[9] The refractive error was responsible for 1.1% legal blindness (which is defined as vision less than 6/60) and 0.5% economic blindness reported by Kalikivayi.[10]

Dandona et al estimated 12.3% total blindness was due to uncorrected refractive error, which is also responsible for a large number of blind years lived by a person than most other causes if left uncorrected. It was estimated that blindness due to refractive error resulted on an average of 30 years of blindness for each person as compared with 5 years of blindness due to untreated cataract for each person.[2] A study by Kalikivayi revealed that out of 115 children with Visual Acuity < 6/18 vision improved by =6/18 with refraction in 109 (94 %). No child was legally or economically blind after refractive correction.[10]

This study aimed to determine the frequency of impaired vision in school children in order to correct the problem in the initial phase which might cause poor performance at school, thereby avoiding drop outs from school due to decreased vision. However the proportion of drop outs due to refractive errors, could not be determined in this study.

Subjects and Methods

Karachi is a mega city with an estimated population of around 14 million. It consists of 18 towns which were part of 5 districts at the time of survey. A cross sectional study was conducted to determine the frequency of eye problems in school children. A complete list of all public sector schools from Board of Secondary Education, Karachi was obtained and then four schools from each district were selected using random digit table. All the selected schools were visited to get the list of all students and then subjects were selected by random sampling technique.

A sample size of 1000 children was estimated and it

was decided that 200 children will be screened in each district. A written permission was obtained from the Ministry of Education, Sindh and a verbal consent was obtained from teachers and parents.

The information regarding age, sex, problems of the eye, vision etc was recorded on a performa and the Snellens chart was used to measure the visual acuity. The colour card and pin holes were also utilized. WHO criteria of visual acuity < 6/18 were taken as visually impaired while < 3/60 was taken as blindness.[11] A visual acuity of 6/12 does not usually effect school performance and hence are not considered as visually impaired in the current international literature. The criterion of blindness was taken to mark the upper limit for the impaired visual acuity and to separate out visually impaired from blind.

All children enrolled from class 1 to class 5 were included in the study. All children below 5 years and any child with congenital eye disease were excluded from study.

Following variables were selected for the study, beside the socioeconomic and demographic factors; Height and weight of the child, mid arm circumference, number of siblings, number of siblings using glasses, type of eye problem, type of medicine used, (the inquiry was about drops, ointment, any local remedy e.g. honey, surma etc actual drug names were not asked) Visual Acuity, Colour blindness, Correction with pinhole. (We inquired about any problem of eye during last 15 days and if yes, verbal autopsy was done to find out about watery discharge, infection, trauma or any other problem.)

After approval from ethical committee of the Baqai Medical University, the team of trained personnel visited the selected schools. In case of absenteeism schools were revisited, some times thrice, to complete the examination for the difficult cases. A standard examination procedure was used for each study subject. Detailed history, including family history, about the current problems, past problem, treatment, medicine used was recorded. Visual acuity was done through Snellen chart for distance vision and cards for near vision. Children who failed to pin hole correction were referred to Baqai Institute of Community Ophthalmology, Karachi for further examination.

All the data obtained was entered into SPSS version 13 and analyzed. Frequency tables were used to describe the data. Mean, median, mode, standard deviation and ranges were determined. The frequency of various eye problems was also determined along with 95% confidence interval. Chi square test was used to observe the association of the refractive error with respect to age, sex, education of father, occupation, ethnicity, class, and nutritional status, p-value <0.05 was considered significant.

Results

Out of 1000 estimated students 940 were actually examined. The result showed that students had a mean age of

Table 1. Distribution of study variables.

Age	Below 10 (65%)	10 and above (35%)				
Sex	Female 504(53.7%)	Male 436(46.3%)				
Class	I 193(20.5%)	II 136(14.5%)	III 202(21.6%)	IV 215(22.8%)	V 194 (20.6%)	
Ethnic group	Urdu speaking 424 (45.2%)	Balochi 178 (8.9%)	Sindhi 142 (15.1%)	Punjabi 82 (8.7%)	Pathan 84 (8.9%)	Others 30 (3.2%)
Students ever examined for eye morbidity	Yes 103 (10.9%)	No 837 (89.1%)				
Eye morbidity	Yes 427 (45.4%)	NO 513 (54.6%)				
Type of eye morbidity	No problem 576 (61.2%)	Watering 260 (27.6%)	Infection 86 (9.1%)	Trauma 18 (2.1%)		
Type of medicines used	drop 125 (44.9%)	ointment 68 (24.4%)	kajal 50 (17.9)	surma 23 (8.2%)	honey 2 (0.7%)	others 11 (3.9%)
Color vision	Normal 11 (1.2%)	Color blind 929 (98.8%)				
Visually impaired corrected by pin hole	Yes 84 (89.2%)	No 10 (10.8%)				
Refractive error	Present 84 (8.9%)	Absent 856 (91.9%)				
Height	Mean 4.21 ft	Median 4.25 ft	Mode 4.1 ft	Range 2.3-5.8	Standard deviation 0.56	
Age	9.5 years	10 years	10 years	5-15	2.5	
Weight	26.83 kg	24 kg	25 kg	12-60	10.92	
Mid Arm Circumference	6.44 cm	6.5 cm	6.0 cm	4.1-9.8	1.11	

Table 2. Distribution of type of morbidity by sex.

Type of morbidity	Male	Percentage	Female	Percentage	Total	Percentage
Infection	33	(39)	52	(61)	85	23.4
Watery eyes	137	(52.7)	123	(47.3)	260	71.4
Trauma and other	12	(63.2)	7	(36.8)	19	05.2
Total	182		182		364	100%

p-value = 0.04

9.5±2.5 years, with 53.7% being female. In public sectors schools due to late admission and repeated failure one might find overage students in each class. There was a uniform distribution of students except class II which had 14.5% students. Most effected ethnic group was Urdu speaking with a frequency of 45.2%. Only 10.9% students ever had ophthalmic examination. Forty five percent had some form of eye problems, watery eye and infections being the most common. More than 80% used non recommended medicines. The proportion of colour blindness was 1.1% with a 95% confidence interval between 1.097 and 1.103. The proportion of children with refractive errors was 8.9% with a 95% confidence interval between 8.89 and 8.91 as shown in table 1.

A significant difference was noted between the type of eye problem and sex ($p < 0.04$), boys had more watery eyes while girls had more infection as shown in Table 2. The frequency of refractive error was cross tabbed against sex, a highly significant association was observed with female sex ($p < 0.001$) as shown in figure.

There was no significant association of frequency of refractive error with class, ethnic group and other variables in this study.

Out of 94 cases with visual impairment, 10 could not be corrected by pinhole correction, who were referred to Baqai University Hospital for further evaluation.

Discussion

In the present study, the prevalence of refractive error was 8.9% with a legal blindness 1.1%. Criteria for legal blindness was 6/60 as recommended by Kalikivayi.[10]

Study results are in agreement with the result of Kalikivayi[10] and Nepal BP[12]. A lower prevalence has been reported by Dandona et al[4], Afghani et al[7] Naidoo et al[13], Khandekar RB[14] and Garner et al[15] and a high prevalence has been reported by Khan et al[16], Qayyum[5], He M[17], Goh PP[18], Maule E[19], Hyman L et al[20] Gordon A[21] and Wingert TA.[22]

Mean age was in agreement with Kalikivaya.[10] In the present study, no association was found between age and the prevalence of refractive error. Our results are in agreement. with Murthy[9] while Kalkivayi[10] and Junghans et al[24] have reported a significant association of refractive error with advancing age among the two groups (less thatn 10 and 10 or more). .

In this study, a highly significant association was found between female sex and refractive error. This is similar to other studies by Afghani et al[7], Awan et al[6], Khandekar RB[14], Dandona et al.[4] However Kalikivayi et al,[10] Junghans et al[23] and Garner[15] did not find any significant association between gender and prevalence of refractive error.

The most important cause of vision impairment in the current study was refractive error, which is comparable with Kalikivayi et al.[10]

There was a significant difference in the type of morbidity and gender while Nepal[12] did not find any significant difference. This study did not find an association of refractive error with education and occupation of father, which is similar to Murthy et al[9] while it is in contrast to Dandona et al[4] who found a significant association between father's education and prevalence of refractive error. The prevalence of colour blindness in this study was 1.1% while Shresthe KK[3] in Kathmando found a prevalence of 2.2%.

Regarding ethnicity, no significant association was observed in this study but in WHO studies this variable is taken into account because refractive errors had a strong relation with inheritance.[18]

In this study frequency of eye morbidity was 45%, which is similar to Reddy SC[24], while Shrestha[3] and Nepal[12] found a low prevalence. Infective disorders accounted for 9.1% of the morbidity in this study which are in agreement with Shrestha.[3] It was observed that local and uncertified medicines were used for the local problem e.g. Kajal and Surma etc.

Conclusion

It was concluded that the refractive error is one of the most common cause of visual impairment.

It has strong relationship with sex and was predominant in females. Majority of students were never examined for the visual acuity. It is recommended that children should be examined periodically from grade 1 to 10. Best possible time is to examine at the time of entering school and when they are leaving which makes it at least twice, during their study period.

Acknowledgment

We are thankful to Director Board of Secondary Education, Baqai Medical University and all the school teachers who supported us in every stage of the study.

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